having been $\frac{1}{19700}$: the value resulting from the satellite-observations is preferred. A further account of this important memoir by the eminent American astronomer is reserved for next week.

THE MINOR PLANETS.—M. Leverrier's *Bulletin International* of Sept. 30 mentions the observation of a small planet, on Sept. 21st, by M. Perrotin at Toulouse, 13th mag., which may possibly be new, though at present there is a chance of its identity with No. 77, which is in the same quarter of the sky and has not been observed since 1868, or with No. 137, of which no elements have yet appeared. Its place at 8 P.M. was in R.A. 23h. 16m. 8s., and N.P.D. 95° 12′.

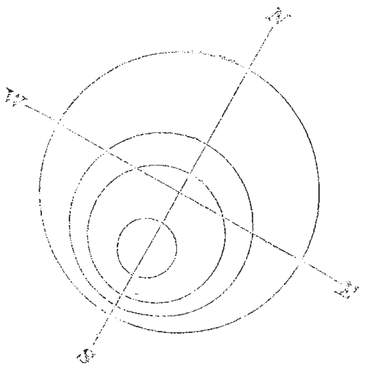
THE TOTAL SOLAR ECLIPSE OF 1878, JULY 29.—The *American Ephemeris* for 1878 is published. The elements of the total eclipse of the sun on July 29, derived from the Lunar Tables of Prof. Peirce, which are adopted for the calculations in that work, are almost identical with those of the *Nautical Almanac*, founded upon the Tables of Hansen, Denver. Colorado appears to be one of the principal places within the limits of the shadow, though some distance from the central line. The sun will be centrally eclipsed on the meridian, according to the *American Ephemeris*, in long. 139° 8′ W., lat. 60° 32′ N.; and according to the *Nautical Almanac*, in long. 139° 10′ W., lat. 60° 27′ N.

MAYER'S METHOD OF OBTAINING THE ISOTHERMALS OF THE SOLAR DISC

THE short notice which I published of my "Discovery of a method of obtaining thermographs of the isothermal lines of the solar disc" was so concisely written that the precautions which are necessary in this new method of research were omitted; but as the republication of my paper in NATURE (vol. xii. p. 301) and in other European journals may induce those engaged in astronomical physics to try the process, I think it proper that I should call attention to some very important experimental conditions to be fulfilled before accurate results can be reached.

1. Special precautions must be taken to prevent currents of air from acting on the film of double iodide.

2. If the image of the sun be formed on the blackened side of the paper, it is absolutely necessary that uniformity should be given to this coating of lamp-black. So difficult is this to achieve that I have generally formed the sun's image directly on the film of iodide. Slight irregularities in this film do not appear to affect the form of the isothermals; but the latter follow irregularities in the smoked surface.



3. The most important, and indeed absolutely essential, condition in these experiments is that the image of the sun shall be formed on a truly *horizontal surface*; for the centre of gravity of any isothermal formed on an *inclined* surface is always *above* the centre of the sun's image and in a vertical plane passing through this centre. Hence all isothermals thus formed are very excentric when referred to the sun's centre. They are also elliptical. The accompanying figure gives isothermals obtained on an inclined surface. *N S* is the solar axis. On obtaining these same isothermals on a horizontal surface they were, as near as could be seen, circular and concentric with the sun's image.

Of the influence of an inclined surface in displacing the isothermals there can be no doubt, and the same action has effected all of the results which have been obtained in the employment of thermopiles in connection with the sun's image received on screens attached to equatorial telescopes. This displacement would mislead an observer, and would cause him to be of the opinion that there existed a decided difference of temperature between the north and south solar poles, and between the portions of the periphery of the sun's image near the poles and near the solar equator. Do not these facts reached by me explain the difference in the results obtained by Secchi and Langley?

The above effects of inclined surfaces appear to be caused by a film of hot air which flows up over these surfaces, and especially on the lower surface of the screen. If the sun's image is received on a film of iodide enclosed between plates of glass or of mica, the excentricity of the isothermals is hardly apparent at first; but after some time it appears, produced by the action of the ascending film on the surface of the glass.

The proper method of research is to use a simple Fahrenheit's heliostat with a good plane mirror, and to throw the solar rays in the direction of the polar axis of the instrument. These rays traverse lenses of from 12 to 30 feet focus, and just before they have converged to form the solar image they are reflected perpendicularly, by another plane mirror, on to the horizontal surface of the iodide.

ALFRED M. MAYER

FAYE ON THE LAWS OF STORMS[*]

Examination of the Theory of Aspiration.—After a somewhat detailed account of opinions held regarding waterspouts in the prehistoric and Roman epochs, and from the sixteenth century downwards, all agreeing in this, that the water of the sea is sucked up to the clouds by these meteors (Fig. 6), M. Faye inquires, How then could it be doubted that waterspouts, and consequently tornadoes, typhoons, &c. are simply phenomena of aspiration?[†] Such has been in reality, since the time of Franklin, the point of departure for meteorologists; and hence the prevailing notions regarding hurricanes, that they are centripetal and formed by horizontal currents of air flowing from all quarters towards the centre of aspiration.

Clearly in this case the conclusions have not been drawn with the caution which science demands. To accept, with the eyes shut, the most astounding assertions without examination or verification; to believe, for example, that a waterspout could suck up the water of the sea to a height of 2,000 feet when the most powerful pump could not raise it to the height of forty feet; to admit that insubstantial vapours could form a tube whose sides are capable of resisting the whirling masses of water supposed to ascend through it; to assert that deluges of sea-water are engulphed in the clouds where the clouds cannot retain simple drops of rain, is not in accord with the usage of science, and indeed can only be explained by the dominating power of an old prejudice, which is constantly receiving new life and vigour by the persistent testimony of observers already prepossessed in its favour. There is another reason equally good which accounts for this mode of explaining phenomena. Of all physical inquiries, the most difficult are those which belong to the order of mechanics, which as little admit of sentiment in dealing with them as pure mathematics. In those fields of inquiry where pure mechanics can no longer guide us, the crudest hypotheses take root and grow: witness the wild dreams of the astronomers of the seventeenth century. Now the department of mechanics to which falls the exposition of the gyratory movements of liquids and gases, and on which depend exactly the atmospheric phenomena we speak of, does not yet exist, except as a first and most imperfect draft.

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[*] Continued from p. 459.

[†] It not being considered as disputed that a tornado is nothing but a large waterspout, a typhoon only a large tornado, and that there is no essential difference between a cyclone and a typhoon, M. Faye proceeds to test the theory of centripetal aspiration as regards waterspouts and tornadoes, and conceives that the conclusions thus arrived at will have equal weight when applied to the theory of cyclones.

Taken thus at unawares, as it were, and compelled to rely on evidence altogether illusory and suggesting unhesitatingly the idea of aspiration on a vast scale, modern meteorology strives at least to free itself from conflicting impossibilities. Thus, instead of making the waterspout suck up water in its ordinary form, it is assumed that this water is first blown into spray by the conflict of the winds at the base of the waterspout, and then whirled aloft in this form. A curious experiment was even made in 1852 at Washington, for the purpose of showing that this is the case. The following account of it is taken from the "Fourth Meteorological Report to the Senate of the United States," by Prof. Espy:—

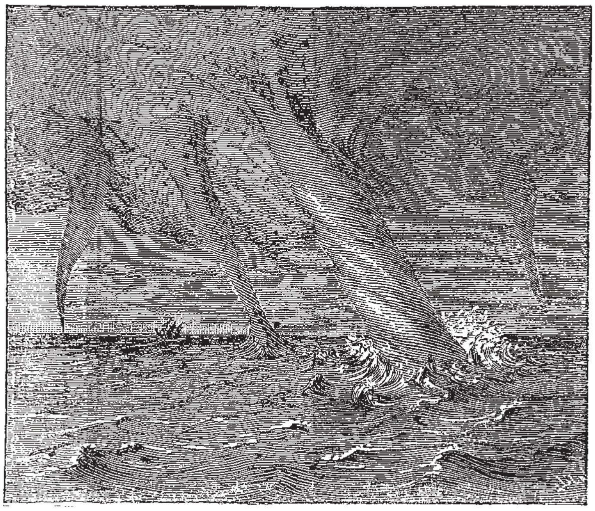

FIG. 6.

'The effect produced by the ascent of a column of air in a narrow space may be thus shown:—If we produce a simple rarefaction of two or three inches of mercury in the upper part of a vertical tube a few feet in length and five inches in diameter, by putting it in connection with the central opening of a machine in full blast, the air will rush into the tube by the lower orifice with a speed proportional to the square root of the diminution of pressure, or about 240 feet per second for an inch of mercury. Then, if a basin filled with water is placed under the opening of the tube and the surface of the water be brought to about 2½ inches from the end of the tube, the water in the basin will be quickly sucked up and ascend the tube, and produce in miniature what takes place in a waterspout. If the tube is glass and of the same dimensions, the water will be seen rising in spray in the form of an inverted cone. This experiment was made in a foundry at Washington in the spring of 1852, in the presence of Prof. Henry and several distinguished members of Congress."

It is singular that none of those present at this experiment remarked the difference there is between a tube of metal or of glass and an almost ideal tube whose bounding surface is only thin insubstantial vapour. The experiment is, however, a proof of the resoluteness with which, in this age even, a belief in the powerful upward suction of waterspouts is entertained.

In order that an ascending current may take place in the atmosphere for some seconds, it is essential that a mass of a lower stratum of air be heated a little more than the air surrounding it. It thus becomes lighter than the layers above it, and consequently rises. In ascending, however, it expands and cools, and soon all further ascent is arrested at a height where the pressure and temperature equal the pressure and temperature of the ascending mass. It is, moreover, replaced from below by air of a lower temperature from all sides. Up to this point there is little, if any, resemblance to a waterspout; there is, however, already the beginning of a movement of ascension, and by means of some new additional hypotheses the phenomenon is completed by giving to it the essential characteristics of a real waterspout.

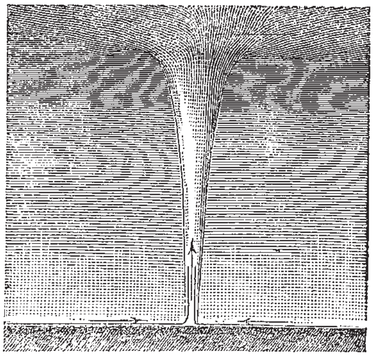

FIG. 7.

Moist air ascends, it is affirmed, more quickly and to a greater height than dry air. Prof. Espy maintains even that it will rise till the limits of the atmosphere be reached in this way:—Moist air in ascending expands and becomes colder; a portion of its aqueous vapour is condensed into mist, and the heat set free in the act of condensation maintains the mass of ascending air constantly at a higher temperature than the stratum of air through which it is ascending. Some physicists consider that these views, thus pushed to exaggeration, are erroneous, but the belief is pretty general, that "the heat due to the condensation" of aqueous vapour is sufficient to raise an ascending column of moist air to a much greater height than an equal column of dry air. Be that as it may, the result would be that when the layers of air resting on the ground are heated by the noonday sun and by radiation, and above all by contact with the ground itself, the equilibrium of the air is disturbed; we should see constantly appearing everywhere a stratum of mist obscuring the rays of the sun. It is useless to point out that this does not represent what takes place. We accept it, however, and proceed.

If we advert to the phenomena of mirage, we find there combined, according to the writers whose theory we are expounding, all the conditions which favour the production of a permanent local indraught of air, and consequently the essential conditions of the waterspout. When the air is perfectly calm and the soil highly heated, the lowest strata of the air are highly heated and thus become specifically lighter than the strata resting over them. But as this excess of temperature is felt at the same time over a wide area, the lower stratum of air rises bodily, so to speak, over the whole region. Now there is no reason why the air should begin to ascend at one place rather than another in the region where the air is perfectly calm; there will be then between the lowest aërial stratum and the one immediately above it a sort of equilibrium, but an equilibrium so essentially unstable that the slightest accident, such as the striking of a light or the flight of a bird, instantly destroys it. As soon as the charm is broken at some point the lower air will there ascend, and as it is charged with moisture it will continue to rise in an ascending column to the higher regions of the atmosphere. In rising, this air will leave a vacuum below it, towards which will rush the air of a lower stratum. This will in turn follow the first in its ascent, and it is seen that gradually the air of this highly heated lower stratum will flow from all sides with an accelerating speed *towards the pathway opened by the first ascending puff of wind.* As this propagation of the horizontal movement extends wider and wider over the heated stratum, the air which arrives at the place where ascending currents have set in will be of the temperature required to keep up the indraught. Further, the *vis viva* of the air currents about the narrow space where the equilibrium was first disturbed will acquire a force capable of producing, a short distance from the point towards which they all converge, very considerable mechanical effects. Then, if the whirlwind advances on the sea, its surface, lashed on all hands by the converging winds, is thrown into a state of ebullition; the spray is drawn up in an ascending column and whirled aloft, however slight may be the spiral form assumed by the horizontal converging currents. The air which rises so violently in the waterspout will be thrust higher and higher, as we have just seen, by the force constantly called into play by the condensation of the vapour into cloud and rain; at length it reaches the high regions of the atmosphere, where it expands and swells into a dense cloud of enormous dimensions. This, then, is the theory of aspiration.

Before a physicist reasons in this way he ought to be well assured beforehand that the facts are as he supposes; in other words, that waterspouts suck up by a vast upright tube the air and the water of the lower strata. Otherwise he would not fail to remark that if the equilibrium, eminently unstable, which he assumes to be established, comes to be destroyed at any point, it would be quickly destroyed over the whole extent of the lower stratum, the different parts of which would then rise freely, each in its place successively, over the small space required for the re-establishment of the equilibrium of the atmosphere. If, in support of any other theory, a similar mechanical combination were proposed to him, he would reject it without hesitation, and say—in order that such phenomena can take place, in order that the lower air should flow horizontally towards a particular orifice and then rise vertically through this orifice, it would require to be forced to do so by some sort of indefinite but solid boarding placed over the lower stratum of air and pressing on it with all the weight of the atmosphere. If a hole be made in the boarding, the air will pass through it; but even in this case, its ascensional force determined by the slight difference in density between the layers on each side of the boarding will not be great, and the column of air issuing through the orifice will rise to no great height. In no conceivable case can it ever exhibit the terrible and destructive force of waterspouts and whirlwinds, or indeed any distant approach to it, under even the most favourable conditions. Lastly, let it be granted that the facts really are as they are supposed to be, and that the lower stratum of air is on every side in a state of motion towards an orifice of a limited size, where there is no material object to divert it from a horizontal to a vertical course, as in Fig. 7; it is plain that aërial currents could not change their course so abruptly in order to stream through this imaginary orifice; they would instantly enlarge and soon altogether efface from the sky the narrow tube of this meteor to which the advocate of aspiration clings because it is the *sine quâ non* of his cherished hypothesis.

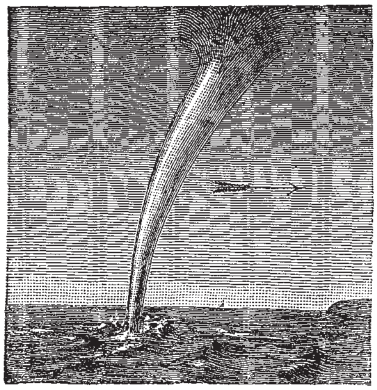

Fig. 8

But we shall pass over all these impossibilities which prejudice so readily forgets, and consider the consequences which result from this theory—not those which might be drawn to show its utter worthlessness, but those which its own partisans have deduced. It is so easy, from what has been said, to produce a waterspout at will, and everything connected with it—large dense clouds aloft with thunder and torrents of rain—that the idea could not but strike some one. Accordingly, it occurred to several persons in America, where the theory of aspiration has been received as favourably as in France, and the artificial production of a waterspout and a thunderstorm in the United States is gravely related in a letter from Mr. G. Mackay, which letter is published in the "Fourth Meteorological Report to the Senate" (Washington, 1857.) It would be a waste of time to make any further reference to an illusion which puts into man's hands the power of originating waterspouts, tornadoes, and typhoons, simply because it makes the phenomena depend on a state of unstable equilibrium in those layers of the atmosphere which immediately surround us.

Refutation of this Theory.—Let aspiration be established by natural or artificial means at one point in the midst of an absolute calm prevailing in the lower stratum of the atmosphere: there is no reason in such a case why the centre of aspiration should be displaced, because all is symmetrical and tranquil round this point. Hence it follows:—(1) Waterspouts, tornadoes, typhoons, and cyclones should be stationary. At most the column of

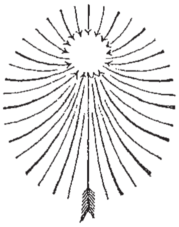

Fig. 9.

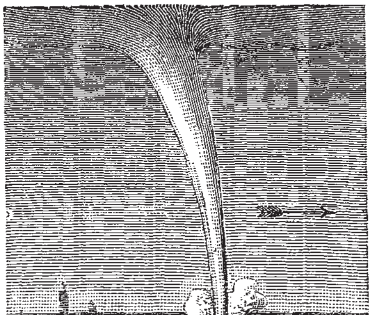

Fig. 10.

ascending air, when it has reached the elevated regions of the clouds, could not be diverted above by upper currents so as to assume the form represented in Fig. 8; for these upper currents could no more displace the focus of aspiration than they could move a locomotive by deflecting the column of smoke which issues from it. (2) The mechanical effects will be very limited, because the aspiring force being measured by a few millimetres of mercury, were the end of the suction-tube to be plunged into a river or the sea, the water would be raised there a few centimetres. Moreover, at the instant when the extremity of the tube reaches the ground or the water, the air ceases to flow into it and fails any longer to keep the ascending column together, and thus all mechanical action ought to disappear at this moment. Further, it is evident that if the phenomenon has its origin in a perfectly calm stratum of air where not a breath of air is felt, the element of mechanical work, that is to say the force or the motion, fails altogether, or becomes reduced to a feeble ascensional tendency in any stratum of air that may have acquired over the place an abnormal excess of a few degrees of temperature.

Compare now with the facts, these two conclusions drawn from the theory. It would be difficult to find a disagreement more complete. Everyone is aware of the ravages produced by hurricanes, typhoons, tornadoes, and even simple waterspouts and whirlwinds—ravages which imply an enormous development of mechanical force. Then, everyone knows that the peculiarity of all cyclones is to possess a movement of translation, often very rapid, which the theory of centripetal aspiration denies to them. Of all waterspouts hitherto observed, only one instance of a stationary one has been recorded; and even the stationary character in this exceptional case may have been not real but only apparent. As regards tornadoes, all those that traversed the United States since 1811 were propagated onwards with a speed varying from four or five to twenty metres a second. The well-known waterspout of Monville, in France, swept over a league in less than four minutes, or at a rate of about twenty metres per second. At such rates typhoons and cyclones, without exception, also advance; their movement of translation is usually increased as they proceed into higher latitudes, and varies from three to eighteen nautical miles an hour, or from two to ten metres per second.

It has been said by the advocates of the theory of aspiration as applied to hurricanes, that if the converging currents are stronger on one side than on the other, the centre of aspiration, that is the base of the waterspout, will be displaced in the direction indicated by the stronger currents, as shown in Fig. 9. But why this difference of speed, especially over the sea, where there are no inequalities of surface over which the different winds blow? The velocity with which air free to move rushes into a suction-tube is determined by the amount of the suction force; if the movement be impeded on one side of the orifice, the air will enter by the other with a determined velocity, but not with a velocity tripled or quadrupled. Moreover, in order that an excess of velocity of twenty metres per second on one side of the centripetally flowing currents could communicate a like velocity to the onward march of the waterspout, it would be necessary that a wind of the force of a terrible tempest blew in that direction exceeding by a velocity of twenty metres per second the contrary wind. This is scarcely compatible with the absolute calm which ordinarily prevails round waterspouts, tornadoes, and even typhoons.

Fig. 10 represents the appearance of a waterspout whose base is represented as driven forward by a supposed excess of velocity of the inflowing horizontal currents, whilst the top of the ascending column is retarded by the resistance of the air. Now the real figure is that represented in Fig. 11, and it agrees neither with Fig. 9 nor with Fig. 10.

It will be seen on reflection that under all these attempts at explanation there lies a settled conviction which Pliny has aptly expressed in these words: "Quum spissatus humor rigens ipse se sustinet,"—the idea, in fact, which was naïvely reproduced in the experiment at the foundry at Washington, in which it was tacitly assumed that the column of a waterspout or tornado is composed of some rigid material, and that it may be displaced bodily by a force acting on its lower part. In truth, the force which could so act is not to be found. The explanation suggested by Prof. Mohn, that the movement of translation of storms is determined by a difference in the average pressure in the front as compared with the rear of the storm, caused by the condensation of vapour which takes place in front, is insufficient, because we see waterspouts and tornadoes marching onwards, from which not a single drop of rain falls.

No navigator has ever shown that there is in a cyclone the least indication of a decided movement of ascension to which the essential cause of the phenomenon is attributed. Everyone speaks about ascending currents, but no one has seen them, or seems even to have had the idea of verifying their existence in the case of their assumed hurricanes of aspiration. The whole thing is taken for granted, and preconceived notions, whose origin we have traced, have complete control over their thoughts.

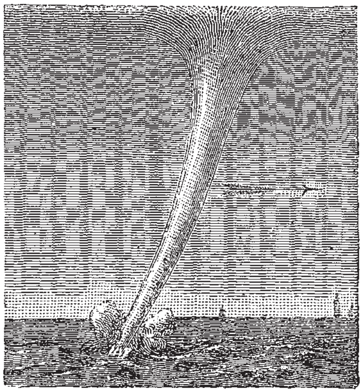

FIG. 11.

As regards waterspouts, no manner of doubt is entertained, for the water is seen whirled up their columns skywards. If this were really the case, waterspouts and tornadoes might draw up even to the sky the thousands of trees which they uproot, and a little afterwards furnish the spectacle of a whole forest tumbling from the clouds, it being evident that thousands of trees may be transported as easily to the clouds as thousands of tons of seawater. Eye-witnesses are not wanting to prove that branches of trees have ascended beyond the clouds, they having been seen lying at some distance on the ground, covered with hoar-frost in the middle of summer.

What remains then of the theory of hurricanes which is based on centripetal aspiration? It starts from a prejudice, sacrifices at the outset the simplest notions of mechanics, and does not take the trouble to represent a single characteristic trait of the phenomenon. Is it then on this theory we are to rely for the rectification and completion of the laws of storms? Shall we borrow from it, in order to correct the diagrams of Reid and Piddington which are perhaps in some cases too absolutely circular, the hypothesis of centripetal currents suggested by it. Especially shall we sacrifice to it the practical rules of navigation followed during the past thirty years? Unhappily there is some cause for fear, for sailors themselves have long since been prepared by the tales and narrations of the forecastle, for these ideas of aspiration affirmed regarding tornadoes, typhoons, and cyclones. If then they are told that in a particular case one of the laws of storms has suffered an exception, that the wind has on one occasion not blown perpendicularly to the direction of the centre, they will be tempted to cast aside the rules which have hitherto guided them. This would only be to sacrifice reality to an empty illusion, and science to error.

It is for this reason that we have insisted at some length on a prejudice which might result in consequences so deplorable. But half of our task is still before us. We have yet to point out the true theory of these phenomena, and to show how the sailing rules hitherto adopted are justified by it. In this way will these rules, thus cleared from empiricism, be invested with the authority which they at present stand in need of.

(*To be continued.*)

NOTES

THE following are some of the principal works in the various departments of science and in travel which are announced for publication during the present season. Messrs. Longman and Co. have the following in preparation:—"The Moon and the Condition and Configurations of its Surface," by Edmund Neison, F.R.A.S., illustrated with maps and plates. "An Epitome of the Geology of England and Wales," by Horace B. Woodward, F.G.S., Geologist on the Geological Survey of England and Wales; and a new volume of the "Text-Books of Science," "Telegraphy," by W. H. Preece, C.E., and J. Sivewright, M.A. "Shooting and Climbing in the Tyrol," with an account of the manners and customs of the Tyrolese, by W. A. B. Grohmann, with numerous illustrations from sketches by the author. "The Frosty Caucasus, an account of a walk through part of the Range and of an ascent of Elburz in the summer of 1874, by F. C. Grove, with map, and illustrations engraved on wood by E. Whymper, from photographs taken during the journey. "The Indian Alps and how we crossed them," being a narrative of two years' residence in the Eastern Himalayas, and two months' tour into the interior towards Kinchinjunga and Mount Everest, by a Lady Pioneer. This work will contain a large number of wood engravings and twelve full-page chromolithographs. "A Journey of a Thousand Miles through Egypt and Nubia to the Second Cataract of the Nile," being a personal narrative of four-and-a-half months' life in a Dahabeeyah on the Nile; with some account of the discovery and excavation of a rock-cut chamber or Speos at Aboo-Simbel; descriptions of the river, the ruins, and the desert, the people met, the places visited, the ways and manners of the natives, &c., by Amelia Edwards, author of "Untrodden Peaks and Unfrequented Valleys," &c. The work will also contain ground plans, facsimiles of inscriptions, a map of the Nile from Alexandria to Dongola, and about seventy illustrations engraved on wood from finished drawings executed on the spot by the author.—Messrs. Sampson Low and Co. have nearly ready for publication Mr. John Forrest's "Explorations in Australia." The work will include three different journeys, namely: (1) Expedition in search of Dr. Leichardt and his party; (2) A journey from Perth to Adelaide, around the Great Australian Bight; (3) From Champion Bay across the desert to the Telegraph and to Adelaide. The book will contain illustrations from the author's sketches. Messrs. Longman have also in the press the following:—A work by Dr. Arthur Leared, on "Morocco and the Moors," being an account of travels, with a general description of the country and its people, with illustrations. A new volume on Assyria, by Mr. George Smith, entitled "Assyrian Discoveries," containing the Chaldean accounts of the Creation, the temptation and fall of man, the Deluge, the Tower of Babel and Confusion of Tongues, Nimrod, &c. This book will be profusely illustrated. A translation of Herr Edouard Mohr's "Nach den Victoriafällen des Zambesi" (reviewed in NATURE, vol xii. p. 231), containing an account of the South African Diamond Fields, &c., is also promised; it will be accompanied by numerous full-page and other woodcut illustrations, several chromolithographs, and a map.—Messrs. Daldy, Isbister, and Co. have in the press a "Geology for Students and General Readers," embodying the most recent theories and discoveries, by A. H. Green, Professor of Geology and Mining in the Yorkshire College of Science. It will be divided into two parts, the first containing the elements of Physical Geology; and the second, the elements of Stratigraphical Geology. Each part will contain upwards of 100 illustrations by the author.—Messrs. Macmillan and Co. have in preparation for the ensuing season, "A Course of Practical Instruction in Elementary Biology," by Prof. Huxley, F.R.S., and H. N. Martin, B.A. "The Modern Telescope," by J. Norman Lockyer, F.R.S.; lectures delivered at the Royal Institution, with additions by G. M. Seabroke, F.R.A.S. This work will be copiously illustrated, and will be uniform with the author's "Solar Physics." Also a work on "Stethometry: Examination of the Chest by a new and more exact method;" with some of its results in physiology and practical medicine, by A. Ransome, M.D. The two following books of travel will also be published in the autumn by Messrs. Macmillan and Co.:—"The Two Expeditions to Western Yunnan, commanded by Major Sladen and Col. Horace Browne," by Dr. Anderson, Director of the Indian Museum, Calcutta, and Professor of Comparative Anatomy in the Medical College, Calcutta, with numerous maps and illustrations. "The Zoology and Geology of Persia," by W. T. Blanford, with narratives of travel by Majors Lovett, St. John, and Evan Smith, and an introduction by Sir Frederick Goldsmid. This work will contain coloured plates and maps, and will be issued in two octavo volumes.—Among Messrs. Smith, Elder, and Co.'s announcements of forthcoming books we notice the following which may be of interest to our readers:—"Science Byways," by Richard A. Proctor; and "Notes on the Climate of the Earth, Past and Present," by Capt. R. A. Sergeaunt, Royal Engineers. This last work will be illustrated with diagrams.

THE Yorkshire College of Science at Leeds, which was informally opened a year ago, was formally "inaugurated" yesterday by the Duke of Devonshire and other eminent men. There was a luncheon in the Great Northern Hotel, and a public meeting in the evening, addressed by the Right Hon. Lyon Playfair and others. The first session of this College, it is said, was as successful as could be expected. We have already stated that we cannot regard this institution on its present basis as satisfactory. Except for students whose education up to a certain point has been complete, the curriculum of a science faculty by itself, however complete, may easily do more good than harm. What we want are not separate science colleges, but first-rate secondary schools in which science should find its proper place. When these secondary schools exist, then the students who have passed through them may benefit from a technical school in which no literature is taught—but not till then.

THE inaugural sitting of the International Geodesical Congress took place on the 20th September at the Ministry of Foreign Affairs, Paris, under the presidency of General Hanez, the delegate for Spain. No delegate was present for Great Britain or for the United States; the German Empire was represented by General de Bayer, the Russian Empire by General de Broch, the Austrian Empire by Dr. Oppolzer; Italy, Belgium, Roumania, Switzerland, and the several German States were also represented. M. Charles Jourdain, member of the French Institute, and general secretary of the Minister of Public Instruction, delivered a speech in the name of M. Wallon, who is travelling in the provinces. It was replied to by General Hanez and by Ge-